of the twenty-ninth embodiment shown in Fig. 64A;

Fig. 66 is a schematic sectional view of a bonded state achieved by using the insulating resin layer employed by the method and apparatus for mounting the electronic component of, for example, an IC chip on the circuit board of the twenty-ninth embodiment shown in Fig. 64B;

Fig. 67A and Fig. 67B are schematic sectional views of a bonded state achieved by using the insulating resin layer employed by the method and apparatus for mounting the electronic component of, for example, an IC chip on the circuit board of the twenty-ninth embodiment shown in Fig. 64C and Fig. 64D;

Fig. 68A, Fig. 68B, Fig. 68C, Fig. 68D, Fig. 68E and Fig. 68F are graphs showing various relations between the amount of the inorganic filler of the insulating resin layer employed by the method and apparatus for mounting the electronic component of, for example, an IC chip on the circuit board of the twenty-ninth embodiment and the position in the direction of thickness of the insulating resin layer;

Fig. 69 is an explanatory view of a manufacturing process of the insulating resin layer employed by a method and apparatus for mounting an electronic component of, for example, an IC chip on a circuit board according to a thirtieth embodiment of the present invention; and

Fig. 70 is a partially enlarged view of Fig. 69.

Best Mode for Carrying Out the Invention

Before the description of the present invention proceeds, it is to be noted that like parts are designated by like reference numerals throughout the accompanying drawings.

Embodiments of the present invention will be described in detail below with reference to the drawings.

(First Embodiment)

A method and apparatus for mounting an IC chip on a circuit board as an example of an electronic component mounting method and apparatus and an electronic component unit or module such as a semiconductor device in which the IC chip is mounted on the board by the mounting method, according to a first embodiment of the present invention will be described below with reference to Fig. 1A through Fig. 14.

Reference is first made to the method for mounting an IC chip on a circuit board according to the first embodiment of the present invention with reference to Figs. 1A through Fig. 4C and Figs. 6 A through 6F.

A bump (protruding electrode) 3 is formed on an Al pad electrode 2 of an IC chip 1 that serves as one example of the electronic component of Fig. 1A by a wire bonding device through the operation shown in Fig. 3A

through Fig. 3F. That is, a ball 96 is formed at the lower end of a wire 95 protruding from a capillary 93 that serves as a holder in Fig. 3A, and the capillary 93 that is holding the wire 95 is lowered in Fig. 3B so as to bond the ball 96 to the electrode 2 of the chip 1, roughly forming the shape of the bump 3. By making the capillary 93 start to move up while downwardly feeding the wire 95 in Fig. 3C, moving the capillary 93 in an approximately rectangle-shaped loop 99 as shown in Fig. 3D to form a curved portion 98 on the bump 3 as shown in Fig. 3E and tear off the wire, the bump 3 as shown in Fig. 1B and Fig. 3F is formed. Otherwise, by clamping the wire 95 by the capillary 93 and pulling the capillary 93 upward in Fig. 3B, the metal wire of, for example, a gold wire (gold line) 95 (note that the examples of the metal wire include those made of zinc, aluminum, copper, or an alloy obtained by incorporating a trace element into these metals, and the gold wire (gold line) will hereinafter be referred to as a representative example in the following embodiments) may be torn off so as to form a bump 3 of a shape as shown in Fig. 3G. A state in which the bump 3 is thus formed on each electrode 2 of the chip 1 is shown in Fig. 1B.

Next, in the present embodiment, an anisotropic conductive film (ACF) sheet 10 is interposed as one example of the anisotropic conductive layer when the IC chip 1 with